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USSR Report

MILITARY AFFAIRS

No. 1741

AVIATSIYA I KOSMONAVTIKA

No. 9, September 1982

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CONTENTS

TABLE OF CONTENTS: 'AVIATSIYA I KOSMONAVTIKA' No 9, Sep 82

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) p 48

[Full-text translated articles published in this report are indicated with an asterisk (*)]

[Text] CONTENTS Page

On the Cover

Outside front--Masters of combat application Major Ye. Bylinkin, Captain A. Kravchenko and majors A. Selyavko and V. Smirnov (left to right) prior to taking off for aerial combat. Photo by L. Yakutin.

Inside front--Friendship makes them strong. Photo by A. Kurbatov.

Inside back--The motherland's armored shield. Photo by I. Kurashov.

Outside back--Insignias of courage and proficiency.

11004
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EDUCATIONAL, TRAINING NEEDS IN ACADEMIES DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) pp 1-3

[Article by Mar Avn N. Skomorokhov, chief, Red Banner Order of Kutuzov Military Air Academy imeni Yu. A. Gagarin, twice-awarded Hero of the Soviet Union, doctor of military sciences: "Training Command Personnel"]

[Text] Great is the responsibility of Soviet officers, and honorable and complex are their obligations. The party and the people have given them the mission of strengthening the battleworthiness and combat readiness of the armed forces. Being an inherent element of the armed forces, the air force possesses remarkable commanders, political workers, engineers and technicians who are ideologically mature, who know their business well and who are capable of fulfilling any orders of the motherland. Now that new forms of combat equipment are arising and the conditions of armed conflict are changing, the requirements imposed on officer training are growing more and more. It is with a consideration for this that we are now organizing our work at air force institutions of higher education.

Our academy occupies an important place in the system for training aviation personnel. Its main mission is to train, for the air force, highly idealistic, competent commanders selflessly devoted to the Communist Party and the socialist motherland and capable of correctly organizing and supporting the combat training of subunits and units in peacetime and competently controlling them during war.

Founded in the prewar years, the academy has provided the motherland with thousands of highly skilled air commanders who have brought glory to our air force in the Great Patriotic War by their immortal deeds and who made a worthy contribution to further development of aviation and the theory and practice of its combat use. They include prominent air force military chiefs such as S. V. Golubev, G. U. Dol'nikov, A. N. Yefimov, A. I. Koldunov, A. N. Medvedev, A. P. Silant'yev and others. And today, the academy is still the blacksmith's shop in which air commanders are forged. It conducts research on important problems of military aviation theory, and it provides assistance to line units and military training institutions of the air force.

Guiding themselves by decisions of the 26th CPSU Congress, by the directives of CPSU Central Committee general secretary, chairman of the Presidium of the

USSR Supreme Soviet, Comrade L. I. Brezhnev and by decrees of the party Central Committee and the Soviet government on higher education and on executive personnel training, the academy's command, its political section, its professors and instructors and its party organization are doing everything necessary to make sure that its graduates completely satisfy all requirements imposed on them. The content of these requirements, which account for future development of aviation equipment and the nature of modern warfare, is reflected in the qualifications of graduates in all specialties. As a consequence the academy is able to determine the approach to take in shaping the personalities of the modern air commander-organizer, indoctrinator and warrier.

The quality of commander training depends decisively upon the state and organization of the training and indoctrination process. The academy has everything it needs to make the basic components of training and indoctrination--the content and methods of training and indoctrination, the training material base, the scientific and pedagogical knowledge of the professors and instructors, the training level of the students and their ability to learn--develop and improve constantly. Ideological maturity is an organic alloy of knowledge, convictions and practical actions. Therefore the academy graduate must deeply know and understand the premises of Marxist-Leninist theory, he must be able to realize this knowledge in practice, he must do everything he can to defend the principles of communist ideology, he must persistently implement party policy, and he must have an active life position.

We have as our guideline V. I. Lenin's directive that no school, no university is worth anything if practical abilities are not developed concurrently. The academy devotes special attention to formation of the students' abilities and habits. Important among them are the abilities and habits of organizing combat training and party-political work, of controlling people and of directing the efforts of specialists of different profiles toward attainment of a common goal in peacetime and in a combat situation. Consideration is provided in this case to the continually increasing combat capabilities and complexity of aviation equipment, armament and flight control and support systems. Today, any shortcoming in the training of an air commander may mean ineffective actions, unjustified losses and failure of missions.

The main prerequisite of raising the quality of student training is unity and inseparability of professional and ideological-political training. With this purpose in mind, the academy has established close ties between the departments of social sciences and the operational-tactical and tactical-special departments. The departments of social sciences, which are chaired by major generals of aviation G. Suglobov and A. Zaytsev, are cooperating productively with other of the academy's departments. Command, instructional and analytical habits as well as the habits of party-political work are shaped on the basis of a unified integrated plan embracing the entire period of the student's academy career.

On graduating from the academy, our students begin their immediate job of teaching and indoctrinating personnel, organizing and conducting combat and political training, organizing troop services and solving administrative and housekeeping problems. The graduate becomes the leader of large collectives performing complex and important missions. The professors and instructors have the leading role in the training and indoctrination of the students and in the shaping of

the modern air commander. The academy possesses a powerful scientific-pedagogical potential, and it now employs two distinguished scientists and technicians, 13 doctors and 274 candidates of sciences. The scientific level of the instructors is growing with every year.

The academy devotes special attention to improving the training material base. A special subdivision--a practical training base--was created with a consideration for the nature and needs of the training and indoctrination process. This base has everything necessary for the polishing of command habits: operating training command posts for all branches of aviation, situation analysis and simulation stations, aircraft trainers, automated command control system resources, communication and radiotechnical equipment and the necessary computer technology. Much creative labor has been invested into development of the base by Lieutenant General of Aviation A. Kovachevich and Lieutenant Colonel A. Gurzo. Moreover the operational-tactical departments have their own specialized classrooms. They are intended for simulation of combat activities and solution of operational-tactical and special problems. Broad use is made of computer technology and technical training resources here. The department collectives displayed real creativity in outfitting such classrooms under the guidance of major generals of aviation P. Suvorov and V. Kamenskiy.

Training effectiveness depends on the preparedness of the officers coming to the academy. I must say that we have been devoting increasingly more attention in recent years to selection of graduating students. We have done several things to raise the scientific content and improve the practical orientation of training: We have reworked the programs of the entrance examinations; we have created and introduced new examination procedures and methods of preparing instructors for them; the academy is now participating more actively in preliminary selection of applicants in the troops.

But this is not the limit of the effort. It is very important for the student to want to learn, and know how to learn. To solve this problem, specialists under the guidance of doctor of historical sciences, professor, Major General of Aviation N. Platonov wrote a student manual on the organization and performance of independent study. Reserves are being sought for raising the activity and expanding the participation of students in traditional forms of training, and new progressive training methods are being introduced.

One of the most important missions of the academy is to teach future commanders to rely competently upon party and Komsomol organizations, to direct their activities and to promote further growth in their activity, effectiveness, principles and initiative in solving the problems of maintaining high alertness and combat readiness, strengthening military discipline and insuring flight safety. With this purpose the future commanders are taught the ability to consider the opinion of communists when resolving issues associated with troop training and indoctrination, to support the initiative of communists and Komsomol members, to strengthen ties with active party and Komsomol members, to promptly orient party and Komsomol organizations toward the most important problems, to display adherence to party principles in evaluating attained results and to comply strictly with Leninist norms of party life and with the principles of party leadership.

The training method adopted by any institution of higher education is a unique indicator of its scientific-pedagogical maturity. As a rule our graduates must do their professional work with very little time to spare. This requires a creative approach to solving arising problems. Consequently as we train our students, we must develop their creative, efficient thinking and their ability to apply acquired knowledge and experience to a complex situation. In this connection a need has arisen for introducing new, progressive training methods more resolutely.

Problematic training is believed to be the most effective in the academy. In it, the process of shaping the knowledge, abilities and habits of the students essentially relies upon their creative solution of problems and problematic situations. Problematic training forms qualities in the students typical of creative professional activity, and it promotes mastery of scientific thinking and development of self-education capabilities.

As we know, creative thinking is shaped and developed in the course of surmounting difficulties by intelligent means. In a problematic situation a student comes to recognize a difficulty that requires new knowledge and new methods of action for its resolution. Such a situation is the initial and principal concept of problematic training methods.

Problematic presentation and, in part, the solution search (heuristic) method have enjoyed the greatest application in the academy's training process.

Special lessons, scientific methodological conferences and instructor training rallies were conducted and an instruction manual was written and published with the purpose of providing assistance to the instructor staff in introducing the methods of problematic training.

Problematic training and other progressive methods are being actively introduced into the training process by major generals of aviation G. Molokanov and A. Sinyukov, colonels N. Perov and A. Krylov and reserve colonels M. Yermolayev and N. Gapiyenok.

In his speech to the Sixth All-Army Conference of Primary Party Organization Secretaries, USSR Minister of Defense Marshal of the Soviet Union D. F. Ustinov pointed out that it would unimaginable today to lead troops and to teach and indoctrinate without scientific knowledge or in opposition to scientific thought. In this connection the priority task the academy has posed to itself is to teach the students to conduct military scientific research independently and to creatively execute combat missions. The training and scientific base of the academy provides opportunities for a broad range of scientific research. For example students are encouraged to work on individual problems contained in the scientific research plans of the departments, and to do research on topics provided by the scientific societies of the different schools. The students also participate in various reviews, scientific seminars and efficiency and invention efforts, and they conduct experiments in support of their diploma projects.

Today more than 80 percent of the students are participating in the work of the academy's military-scientific societies, and many of them are studying

important problems of modern combat pertinent to air subunits and units. Military-scientific student conferences held each year indicate that students can independently develop new tactics of aerial combat and new methods of making air strikes in the complex conditions of modern warfare against a strong opponent.

Of course, an interest in scientific research and in gaining a deep understanding of the development of military affairs does not come about on its own. It is the result of meticulous work with the students by the entire professor and instructor staff, and of competent leadership of the study circles of the military-scientific societies. These efforts are best organized in the departments chaired by Major General V. Polyakov and colonels V. Palaguta and B. Lariokhin.

The results of state examinations and responses from the units on the work of academy graduates are showing that the quality of the training afforded to air commanders is basically satisfying today's requirements. But at the same time, quite naturally the growing tasks of defending the accomplishments of socialism and communist development, the increasing pace of scientific-technical progress, development of military science and the experience of troop combat training are bringing out new problems in personnel training, ones which persistently require that we seek new solutions. In my opinion the main ways for solving these problems are: more thoughtful selection of officers for academy training from line units; intensification of the operational-tactical training of the students and assumption of a more practical orientation in their training; improvement of the training material base and of control of the training and indoctrination process.

Improving applicant selection, we are trying to organize the preparation of applicants jointly with the line units, and in the entrance examinations we test more deeply not only their knowledge but also their practical habits.

What we mean by raising the effectiveness of indoctrination work is to achieve deeper study and creative assimilation of Lenin's ideological and theoretical legacy, the decisions of CPSU Central Committee congresses and plenums and the works of Comrade L. I. Brezhnev by the students. We approach development of the habits of party-political work and command and instructional habits in integrated fashion, planning this work for the entire training period with the help of all categories of officials in the academy.

We are improving the operational-tactical training of the students and the practical orientation of their training by perfecting the training plans and programs, by establishing closer ties between the academy and the troops and by raising the quality with which the professors and instructors are prepared.

The training material base is being perfected in the following directions: equipping the practical training base with resources for studying two-sided combat activities and evaluating the results; raising the quality of the instructor training materials; making fuller use of the potentials of the specialized classrooms, technical training resources and computers.

The academy is doing a great deal of work to improve control. We are devoting our main attention to improving control of the training and indoctrination process and of the effort to introduce scientific organization of labor.

Air commanders are trained through the joint efforts of aviation schools, academies and line units. Consequently the period of training in the academy must be viewed as just one of the stages of a continuous process of the air commander's formation, one which lasts from the moment he enters the school until the moment he leaves the army. Therefore efforts to improve the training of air commanders on the basis of a unified, integrated program appear extremely expedient. It would be pertinent to note here that our academy is cooperating closely with military aviation schools, it is helping them correct their plans and programs and improve their training process, and it is training instructors for them.

As with other military educational institutions, the academy has begun its new training year. The places of graduates who have gone back to service in the troops have now been taken by a new complement of officers. Our mission is to provide them with a deep knowledge of social, military and special sciences, to teach them to work with the future in mind, and to make them ideologically steadfast, competent specialists, real commanders, organizers and indoctrinators.

Working toward the glorious 60th anniversary of formation of the Union of Soviet Socialist Republics, the personnel of the Air Academy imeni Yu. A. Gagarin are devoting all of their efforts, experience and knowledge to strengthening the fighting power of our valorous air force with a sense of high responsibility before the party and the Soviet people.

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MILITARY-SCIENTIFIC SOCIETIES IN ACADEMIES

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) p 14

[Article by Maj Gen Avn A. Bublik, chief, air force school, Military-Political Academy imeni V. I. Lenin: "Following the Commandments of the Leader"]

[Text] At the dawn of Soviet rule, noting the importance of a scientific approach to strengthening the country's defense capabilities, V. I. Lenin emphasized that is impossible to organize a modern army without science. This fundamental directive of the leader of the proletarian revolution was laid at the foundation of all of our party's activities associated with development of the military.

Lenin's words have special urgency today, now that the achievements of developed socialist society and scientific-technical revolution in military affairs are imposing qualitatively new requirements upon the ideological-political and professional training of military personnel.

CPSU Central Committee General Secretary Comrade L. I. Brezhnev noted in the Accountability Report of the CPSU Central Committee to the 26th CPSU Congress: "A firm alloy of high equipment availability, military proficiency and inviolable morale--such is the combat potential of the Soviet Armed Forces." The effort made by the 26th CPSU Congress to solve the problems associated with the combat potential of the Soviet Armed Forces was an outstanding contribution to development of the Marxist-Leninist teaching on war and the army--a teaching that serves as a dependable reference point for the military policy of the USSR and countries of the socialist fraternity associated with dependably protecting the accomplishments of socialism and preserving peace on the planet.

The party's demand for strengthening the combat potential of the Soviet Armed Forces is at the center of attention of the command and party organization of the air force school of the Military-Political Academy imeni V. I. Lenin. Active participation of all students in military-scientific work has been given an important role in solving this problem.

There are seven military-scientific society circles in the school. They are led by experienced instructors from the different departments. Following the

26th CPSU Congress the scientific activity of the students increased noticeably, and the theoretical premises they concerned themselves with began to be tied in more objectively with the tasks of flight and professional training. During this period more than 30 scientific projects were submitted to the All-Union Competition of Student Projects. Competition diplomas were earned by majors P. Chuyko, S. Vysotskiy, R. Pavziyev and other students. We can note with satisfaction that the quality of scientific communications brought up for discussion in the circles and their practical contribution to solving the problems of the moral-political and psychological training of the personnel have increased noticeably. Active participation of the students in military-scientific activity is helping to form their creative thinking and their capability for deeply revealing the essence of the problems of flight training and competently and purposefully conducting party-politica l work in the units and subunits.

Participation of scientists, experienced pilots and political workers of the best air units in the work of the military-scientific society has become a good tradition. Just recently political worker Colonel K. Shapkin, 25th CPSU Congress delegate Colonel G. Vasil'yev, Major P. Posokhov, a graduate of our school, and others discussed their accomplishments in training and indoctrinating airmen. A talk given by professor, Colonel N. Fedenko, who conducted scientific research during exercise "Zapad-81," elicited special interest.

One of the main indicators of every training period is concerned with the party-political work and flight apprenticeship of students in the troops. In recent years the intensity of their flight work and the requirements on the quality with which they complete their training tasks have risen significantly. In the past period all students completed their apprenticeships with grades of "excellent" and "good," they confirmed their class qualifications as military pilots and navigators, and officers A. Andryushkov, Yu. Vikhrenko, S. Talyzin, D. Kosolapov, R. Pavziyev, V. Solomentsev, V. Rep'yev and others successfully retrained with new aviation equipment.

Military-scientific activity plays a great role in solving the problems associated with training political officers to be air warriors. This fact has been confirmed many times by experience. Thus Major S. Grin', a 1981 graduate and a military pilot 1st class, participated actively in the work of the military-scientific society, he served as chairman of the party-political work circle, he devoted a great deal of attention to studying the behavior of pilots in extreme conditions, and he prepared an interesting scientific work on this issue.

Once during his apprenticeship Officer S. Grin' found himself in a complex situation while in the air, and it was only owing to his high moral-psychological qualities and professional training that he extricated himself from the situaion honorably. He completed his assignment, and he saved expensive equipment, for which he was awarded a valuable gift by the air force commander in chief. He is now successfully fulfilling his responsibilities as a political worker, and he enjoys the deserved respect of the airmen.

Not that long ago the academy sponsored a military-scientific conference of students of the air force school, in the work of which a member of the military council--the chief of the Air Force Political Directorate, Colonel General of

Aviation L. Batekhin--took part. In his speech he illuminated the issues associated with raising the combat potential of the air force, and he encouraged the students to solve the problems of moral-political and psychological training of airmen, and of raising the quality and effectiveness of party-political work in the air force units. His report was heard with interest, and his main premises were placed at the foundation of the practical activities of the students.

Now the pitch of the socialist competition for an honorable welcome to the 60th anniversary of the USSR's formation under the slogan "Dependable protection for the peaceful labor of the Soviet people!" is growing at the school. All students have adopted higher pledges, and they are fully resolved to honorably complete them and to strengthen the combat readiness of our glorious air force with new successes in study and service.

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IMPORTANCE OF SELF-EDUCATION DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) pp 10-11

[Article by Lt Gen Avn V. Korobeynikov, chief, Political Section, Main Staff and Directorate of the Air Force Commander in Chief: "The Reserves of Self-Education"]

> [Text] "...the main emphasis in the work of party organizations must be laid on ideological-political and military indoctrination of servicemen, on formation of their keen sense of responsibility for the country's security and defense of socialism."
>
> From the report of USSR Minister of Defense Marshal of the Soviet Union D. F. Ustinov to the Sixth All-Army Conference of Primary Party Organization Secretaries.

Independent study of Marxist-Leninist theory is now acquiring increasingly greater significance in the political, military and professional training of officers. "...the deeper the transformation we wish to achieve," wrote V. I. Lenin, "the higher we must raise interest in it and a conscious attitude toward it, and the more we must persuade more and more millions and tens of millions of its necessity." Self-education and the accumulation and deepening of knowledge have become a necessity and a vital need for all communists.

The CPSU Central Committee decree published on 26 April 1979 emphasized that formation of a scientific outlook in Soviet people, development of selfless devotion to the party's cause and to communist ideals, and indoctrination of a love for the socialist fatherland and proletarian internationalism continue to be the backbone of our ideological work. Mastery of Marxist-Leninist theory is viewed by the party as the most important prerequisite of an uncompromising struggle against reactionary bourgeois ideology. These premises pertain fully to the Marxist-Lenist education of officers. The remarkable, deeply meaningful words of CPSU Central Committee general secretary, chairman of the Presidium of the USSR Supreme Soviet, Comrade L. I. Brezhnev are especially important to us: "It is said that we have to study throughout all of our lives. This old truth is applicable to all. But perhaps it pertains most of all to those who teach others."

The central administration of the air force is conducting a diversified program of ideological-political indoctrination of military personnel. Its content is subordinated to the main goal--deeply studying Lenin's ideological-theoretical and military legacy, the proceedings of the 26th CPSU Congress, documents published by the party subsequently, and the speeches and works of Comrade L. I. Brezhnev and other leaders of the Communist Party and Soviet state. Unweakening attention is being devoted to independent work, an inherent part of Marxist-Leninist training of officers and generals. It is the main method of ideological training of the personnel, and it calls for deep study of the works of the classicists of Marxism-Leninism and decisions of the CPSU. More effective use of this method is what I would like to discuss.

The study of Marxist-Leninist theory within the organized program of political education for military personnel--the Marxist-Leninist training program--helps our officers and generals not only to gain a deeper understanding of the general laws and principles of communist and military development, the specific laws of armed conflict and the scientific principles of military airman training and indoctrination, but also to carefully evaluate their own activities, to foresee and find the ways of improving combat and political training and to knowledgeably solve the problems of troop combat readiness.

Obtained knowledge must necessarily be expanded and deepened, it must be conceptualized, it must be enriched with new information, and it must be transformed into convictions. And what is most important, the decisive method of forming the foundations of such convictions is political self-education, the meticulous, regular and planned political training of every officer and general.

Political self-education is a complex and multifaceted process including listening to basic lectures in the Marxist-Leninist training system and in universities of Marxism-Leninism. But its foundation consists of independent work with the basic sources--the works of the classicists of Marxism-Leninism, documents published by our party, the works of prominent officials of the CPSU and the international communist movement, the works of famous philosophers, historians, economists and military leaders, and supplementary and reference literature. Works of creative literature, memoirs and articles from periodicals are also used.

The personal long-range plan of ideological-theoretical growth is the principal foundation of the political self-education of the officer, general and each communist. It usually consists of several sections. It indicates the literature to be studied, as recommended in the program of Marxist-Leninist training or the university of Marxism-Leninism, and the primary sources and CPSU documents that are not mandatorily studied in organized forms of training.

If the officer is studying on the basis of a specific political training program, or if he is preparing to speak as a member of an agitation and propaganda collective or an agitation and propaganda group on issues concerning the party's domestic and foreign policy, Soviet military development and art, military pedagogics and aviation psychology, improvement of managerial activity, the ideological conflict and other such subjects, his plan would contain a specific bibliography pertaining to some particular social discipline. His training plan also foresees preparation of lectures, reports, abstracts and articles

for newspapers and journals, and participation in efforts to generalize the experience of political indoctrination of subordinates.

Officers V. Makarov, N. Rastorguyev, M. Demidov, O. Petrov and many others have exactly such plans--complete, well-thought out plans. They have all been approved by their immediate supervisors.

Constant improvement of political knowledge by the method of individual training is an important part of the official activities of the officer and general, even though it is performed on their own time, during time off from official duties. Participation of commanders and chiefs in examination and approval of plans raises the activity of executives associated with organizing independent study of subordinates, increases their responsibility for creating the appropriate conditions for self-education of the officers and stimulates the executive to serve as a personal example in constantly studying the treasurehouse of Marxism-Leninism.

Experience has shown that presence of a self-education plan promotes better control over the training of officers on the part of party committees, party bureaus and primary party organizations. And wherever efficient control is maintained over the course of plan fulfillment and daily assistance is provided to officers, wherever the problems associated with the ideological and theoretical growth of communists are kept at the center of the party organization's attention, success is guaranteed.

Party organizations in which comrades Ye. Kovyazin, I. Kartashev, N. Antonov, V. Balykov, A. Dorofeyev, V. Petrykin and S. Oskanov are serving as secretaries are devoting adequate attention to political self-education. They constantly monitor the progress made by officers in studying the works of the classicists of Marxism-Leninism, the proceedings of the 26th CPSU Congress and the pressing problems of party theory and policy, and they make an effort to see that Marxist-Leninist training lessons and independent work by the officers would help them gain a better understanding of the events occurring in our country and abroad, penetrate more deeply into the organization of combat training and service of the troops and correctly combine organizational work with ideological indoctrination. Members of the party committees and party bureaus show a continual interest in the ideological-theoretical training of communists, and they discuss the essence of the materials they are studying with them. As a rule the results of seminar lessons and of officer self-education are regularly discussed at meetings of the party committees and party bureaus.

Reports by communists on their efforts to study Marxist-Leninist theory have become a broad practice. Moreover reports are given not only by those who exhibit certain shortcomings but also by the best officers, so that their work experience could be generalized and the best forms and methods of self-education could be introduced into practice. Thus the party organization headed by communist Engineer-Colonel A. Maslenkov listened to a report by CPSU member Yu. Kostromin, after which it generalized and disseminated the experience he acquired in independent training, in giving lectures and discussions and in holding individual talks with airmen of units and subunits deployed in remote areas. And after hearing officers N. Vedernikov and B. Fedorov, members of the party bureau pointed out the shortcomings in their independent training and

suggested concrete ways to help them. Communists Yu. Golubev and A. Maslenkov devoted a great deal of attention to these comrades. They helped them draw up personal plans for self-education and they steered them away from a rather widespread error--placing too much emphasis on professional training. They also took on the task of monitoring fulfillment of these plans.

One of the most important directions in studying Marxist-Leninist theory is careful preparation of summaries for seminar lessons by officers and generals. In the course of these lessons the students reinforce their knowledge and penetrate into the very essence of the problem. A relaxed, creative atmosphere is created in seminars, and the airmen freely volunteer their own points of view and enter into debates, bringing up substantial, persuasive arguments and evidence.

This is exactly the way lessons are being conducted in the groups led by comrades P. Avdonin, B. Pestrov, N. Nikolenko, P. Novitskiy, L. Strakhov, G. Kirilin, P. Bazanov and many others. The entire secret of successful training of one's students is the personal preparation of the instructors. They independently study and think out the recommended literature, they draw up their seminar plans indicating the purpose and the basic and supplementary issues, and they think out the introduction to the seminar, the conclusion for each issue to be discussed and the order of use of supplementary literature, visual aids and technical propaganda resources. During discussion of summaries and questions these group leaders make sure that every statement made by the students is distinguished by depth and concreteness of the subject's development, and that it is tied in closely with life, with practical tasks. They make sure that what the students say is backed up by a knowledge of the primary sources and by other literature studied in the course of independent work. This approach to the effort raises the effectiveness and efficiency of officer self-education.

The experience of the best Marxist-Leninist training group leaders shows that they are not simply supervisors of their students, that they become the organizers of their political self-education, consultants, indoctrinators and ideological mentors.

Indicative in this respect is the example of communist group leader P. Avdonin. He begins preparing for every seminar lesson well beforehand. Working together with active party members, he decides who needs help. He devotes special attention to students who are to give summaries. The group leader and the party bureau members always provide exhaustive advice and recommendations. Frequently prior to a seminar they conduct supplementary lessons in which they explain certain problems of the subject at hand.

Extensive preparation and a benevolent, comradely situation in lessons promote high activity among the students. Everyone speaks at the seminars as a rule, and some students present their thoughts on several subjects. Frequently discussions of a particular subject turn into debates, in which the problems that are raised are tied in with the tasks of improving the work of the airmen.

Work with books and the ability to concentrate attention on what is most important, to transmit the contents of a book or a problem in one's own words and

to correctly and competently summarize books with minimum time have great significance to officer self-education. The leaders of Marxist-Leninist training groups and active party members constantly make officers aware of the fact that by using Lenin's style of summarizing books and applying Lenin's procedure to work with primary sources, they can not only save time but also isolate the main points of their summaries, determine the criteria by which to assess a book, discern laws and principles, think out and understand the content of a book, deeply assimilate the ideas and essence of every work and evaluate the author's position. It is explained to officers in this case that there must be no stereotypy in either summaries or reports. After all, every student is typified by his own level of development, by his own experience of working with books and by his own educational and professional outlook.

The organizers of officer political self-education--commanders and chiefs, political workers, Marxist-Leninist training leaders and active party members--believe their main objective to be that of helping people extract the meaning of the entire diversity of events, facts and examples provided in books, analyze and organize phenomena into a harmonious system, formulate its essence and reveal the internal ties and dialectical laws.

The objectives and measures of improving officer independent political training are discussed by commanders, chiefs, political workers and the leaders of Marxist-Leninist training groups with members of agitation and propaganda collectives and groups. They are also discussed at meetings of party committees and party bureaus. In every training period, party committee and bureau members check out the way officer self-education is organized, they analyze the content of regular and final seminar lessons, and they review the abstracts. They study the content and format of book summaries, they talk with the students about the essence of the primary sources they are studying, and they offer advice.

Self-education in general and political self-education in particular is a most important prerequisite of improving the personal qualities of every Soviet officer and general, and convictions are one of the leading criteria of the effectiveness with which Marxist-Leninist theory is mastered.

Because of the work of the political section and the party committees and bureaus aimed at achieving deep independent study of the works of the classicists of Marxism-Leninism and the history of the CPSU and the international communist movement, the interest of officers and generals in such study has risen significantly. This is having a positive effect on the way students perform their official and party responsibilities. Persuasive evidence of this can be found in the success enjoyed by communists of the air force central administration in completing the tasks facing them in the year of the 60th anniversary of the USSR's formation.

The need for improving self-education of officers and generals is implied by the requirements of the 26th CPSU Congress, the May (1982) CPSU Central Committee Plenum and decrees of the CPSU Central Committee, by recommendations of the Sixth All-Army Conference of Primary Party Organization Secretaries and by Comrade L. I. Brezhnev's directives on intensifying ideological work and political indoctrination today.

READERS' COMMENTS ON TACTICAL VALUE OF THE PAIR VS THE SINGLE AIRCRAFT CONTINUE

One Can Do It

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) p 4

[Article by Col V. Kachanov, military pilot-sniper]

[Text] The issue raised by Lieutenant Colonel V. Belyayev in his article "The Pair or One?" (AVIATSIYA I KOSMONAVTIKA, No 11, 1981) became topical long ago. As aviation improved, the power of the lone fighter grew. Now it is in a position to perform a mission that would have required a flight of airplanes during the war. Is this not the answer to the question as to whether the pair or the lone airplane should become the basic tactical unit?

The lone fighter has many advantages. He can make complete use of the airplane's possibilities for maneuver. Moreover the pilot is not "bound" to a follower.

Or take another example. Assume that a continuous blanket of clouds covers the sky to stratospheric altitude. It would be difficult for a pair to find each other under these conditions. Of course, every airfield develops its own system of bringing pairs together and breaking them up beyond the clouds, but this takes up precious time. Moreover the probability of intercepting the enemy under these conditions is not that much greater for a pair than for a lone fighter. In such situations the lone airplane is doubtlessly the fire and tactical unit.

The pair is something entirely different in fluid aerial combat. Here of course, it is more dependable, since the leader can promptly assume an advantageous position and make an attack. Initiating combat, the leader doubtlessly tries to force the enemy into a disadvantageous position, thus setting him up for attack by his follower. But even in this case the pair once again in a sense breaks down into lone airplanes.

Performing assignments at low and minimum altitudes, the lone airplane is less vulnerable to antiaircraft resources, since it can maneuver at greater accelerations and utilize the full thrust of the engines. Moreover, consider the time spent in group flight on keeping the follower (leader) under observation. A lone airplane could use this time to search for a target, to survey the airspace and to select a maneuver for attack.

The advantages of the lone fighter over a pair are obvious. I agree completely with Colonel V. Belyayev that the lone fighter must become the basic tactical unit. The principle that a fighter is effective in the air on its own is supported by the powerful weapons carried by the modern airplane, the great range at which the enemy could be detected by onboard radar and the possibility of striking the enemy outside of visual contact. Moreover automatic navigation systems make it possible to approach a target area and make an attack with high precision, and then to maneuver energetically out of the effective zone of surface-to-air missiles.

It seems to me that under today's conditions, we could consider the pair the basic tactical unit only after fighters are equipped with an instrument that would indicate the position of airplanes in a group with sufficient accuracy. But until such an instrument becomes available, the lone fighter would have to remain the basic fire and tactical unit.

When Trouble Comes, A Comrade Will Help

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) p 4-5

[Article by Maj (Res) V. Kazakov, test pilot]

[Text] I have been carefully following the discussion of the article "The Pair or One?". Pilots have been stating intelligent ideas, and forwarding persuasive arguments. Nonetheless the arguments suggested by Colonel D. Goldyrev and his conclusions appear more persuasive to me, especially in the psychological aspect.

The feeling of having a friend nearby is a very strong factor, one which cannot be ignored in peacetime, and all the more so in wartime. I can say from my own experience and that of many of my fellow servicemen that fighters did not like to go out on missions alone during the Great Patriotic War. Not only because the follower served as a shield to the leader and that two pilots were twice as strong in all respects, but also because if one suffered misfortune and had to bail out, the other could give him aid.

I can cite dozens of examples from the war in which a comrade has hastened to the aid of another who had suffered disaster. Sometimes he landed his airplane in the most improbable conditions, taking him aboard and carrying him out of enemy territory. Exceptional bravery, faithfulness to duty and military friendship and the preparedness to sacrifice one's own life to rescue a comrade were manifested in such cases. Here lies the great meaning of Soviet military morality, and the humanitarian essence of our pilots.

It is impossible to land modern fighters on an unprepared runway, and there is no place to put one's comrade. But the location where the pilot's parachute hits the ground could be determined, and the coordinates could be transmitted to command posts. I recall a time when our aviation was making a transition to jets, and the experimental airplanes were always escorted by pilots in conventional airplanes--"guardian angels" we called them as a joke. They monitored

the flight of the jet from some distance away, and they were able to provide the help within their means.

If by fate a person finds himself in trouble, he knows that sooner or later help will come, and even in the most difficult conditions he will not despair.

How would a pilot behave in aerial combat? This depends on many factors. And one of them, the most important it seems to me, is the moral-psychological factor. When considering ways to raise battleworthiness to its highest, we must consider more attentively the possibilities of the pair. They are greater in relation to all parameters than those of a lone airplane.

Of course the possibility is not excluded that commanders will send lone fighters out on missions in the course of combat activities. Every decision is made on the basis of the situation. The situation is precisely what determines which disposition of forces, combat formations and combat tactics and methods are the most sensible. Another factor to consider is the professional skills of the air warriors, the excellence of their group coordination and mutual understanding. So it was in wartime. And apparently little has changed in this regard today. So think many of my frontline comrades.

11004
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TACTICAL MODELING OF RECONNAISSANCE FLIGHTS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) pp 22-23

[Article by Col A. Krasnov, doctor of military sciences, professor: "Measure Seven Times Before You Cut"]

[Text] "Select your tactics on the basis of the situation": This is the rule commanders have long suggested to young pilots, but sometimes they found it difficult to explain how the situation should be identified. How many ways of completing a particular mission are available, for example, to the crew of a reconnaissance airplane? Just the enemy's antiaircraft resources alone will contribute a dozen variables, while the nature of the targets, the weather and the navigational and radar situation will contribute even more. It is on the basis of these data that the tactics and the optimum flight variant must be selected. But it is precisely here that all of the trouble lies.

Assume that a certain objective must be reconnoitered. How is the route to be plotted if the position of the objective and the take-off airfield are known? This would not seem to be a difficult problem. But if the goal is to select the optimum route, we would first have to thoroughly think out and consider several possibilities. The problem is that the concept "optimum route" includes a certain mandatory requirement. After all, the shortest path is not always the best, even though it does mean fast penetration to the objective. Each different situation may have a unique main criterion. Sometimes it is most important to penetrate to the objective covertly, even if it means losing a few minutes, and at other times on the other hand it may be most important to fly the shortest path at high altitude owing to the limited tactical range of the airplane.

There are many factors that make selection of the tactics difficult. Even in a situation with which a scout is familiar, there always remains an area of riddles, of probabilities. There always exists the danger of falling for artful camouflage and deception and misinformation, and of overstating or understating the enemy's antiaircraft resources. Complete information does not and will never exist. Therefore the commander and pilot must utilize fragmentary, obsolete information, experience and intuition. They must consider everything that may have even an indirect influence upon the reconnaissance results. We could say that what is unforeseen in reconnaissance is something which has

not been accounted for by the crew prior to taking off. There is reason behind the saying that aerial reconnaissance is a problem with many unknowns.

Numerous contradictions must be surmounted when choosing the tactics and the variant of a reconnaissance flight. Nervous tension encountered in a situation where there are too many variants is an unavoidable accompaniment of personnel preparing for a reconnaissance mission. How do we uncover and untangle all of these contradictions, or at least the most critical ones?

The diverse conditions that may evolve in a reconnaissance flight may be accounted for by simulation, which permits us to reproduce, study and analyze a flight in terms of its phases and its entirety. This method develops the habits and ability for analyzing a tactical situation, for assimilating combat procedures better, for seeking innovations and for displaying initiative.

In order that the rich possibiliites of simulation could be utilized fully by the scout, and in order that he could embody them in laconic diagrams and graphs, it is very important to clarify the mission and intent of the flying assignment from the very beginning, and then develop the concrete variants of its fulfillment. As an example squadron commander Major N. Terekhov selected the graph analysis method to work out his assignment. It is the simplest, and it does not require anything other than a blank sheet of paper (tracing paper), pencils and previously prepared nomograms and templates. The assignment required covert approach to the reconnaissance objective, determination of its characteristics and coordinates, photography and return to the same airfield. Determining the essence of the assignment, the commander turned the personnel's attention to the fact there were strong "enemy" air defenses on the route to the objective. Available diagrams, drawings and formulas must be used to develop the flight variants. First the raw data to be used in simulation must be selected and systematized, and the quantitative indicators must be calculated and compared. Then the possible flight variants are determined, compared on the basis of certain criteria and evaluated in terms of their individual effectiveness. The most advantageous variant would be adopted as the main one.

On receiving their instructions the pilots and navigators drew the general situation (the locations of the troops, the reconnaissance objective, radar stations, surface-to-air missile complexes and fighter airfields of the "enemy") on tracing paper using the appropriate map scale, and then they began making their preparations on the basis of a previously developed system (see diagram).

During acquisition of the raw data consideration was given to the fact that some of them, for example the characteristics of friendly and "enemy" airplanes, were known to the personnel beforehand, and that others were contained in the assignment. But certain problems required independent solution: how the approaches to the objectives and the objectives themselves were covered and with what "enemy" antiaircraft resources.

Evaluation of the "enemy's" antiaircraft countermeasures required acquisition of the appropriate data, inasmuch as the countermeasures would not be the same on different bearings and in relation to scouts flying at different altitudes and speeds. The available graphs for determining the detection range of ground

radar stations and the onboard sights of interceptors and information concerning the sizes of the kill zones of "enemy" antiaircraft missile complexes were put to use. To determine the possible tactics of evading fighters, the pilots summarized their acceleration and maneuver characteristics, the possibilities of their sights and weapons and the areas of attack in tables and graphs.

A second no less important problem was that of evaluating the reconnaissance objective. For this purpose the crew prepared data on its dimensions, contrast, detection signs and other characteristics, and they graphed the range of detection from different altitudes and at different levels of visibility. Then using a map which also served as a terrain model, they evaluated the topography in terms of covert approaches to the objective at low and minimum altitude. They studied the weather conditions, visibility and the position of the sun at the moment of the approach to the objective. Then they had to consider and analyze the possibilities of their own airplanes and reconnaissance cameras, which would have a considerable influence on the dependability of the subsequent calculations and the final goal of simulation.

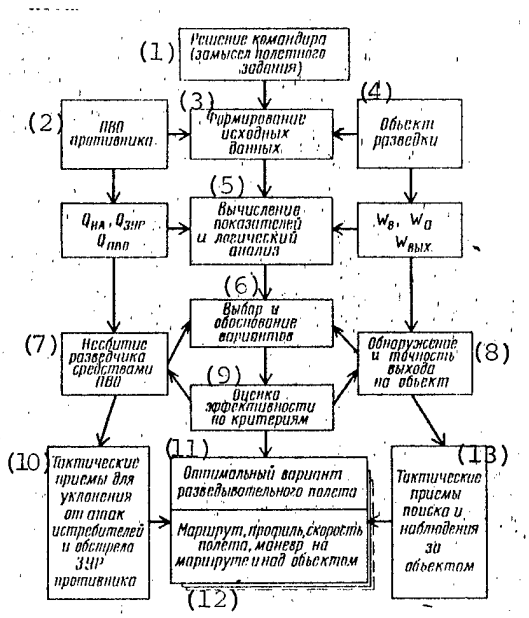
Finally all of the graphs were gathered together, and templates were made. The trajectories of maneuvers within the required altitude ranges, the velocities and accelerations of the reconnaissance airplanes, the area covered by the cameras and the kill zones of antiaircraft missile complexes were calculated and plotted at map scale on the templates. Now logical analysis could begin.

Movement of the reconnaissance airplane toward the objective through the "enemy" antiaircraft grouping, represented on tracing paper, is simulated. The different situations in which the crew may find itself have to be analyzed, and the probability that they would satisfy the basic indicators of the assignment has to be determined. These indicators (see diagram) were calculated one at a time by the crews on the basis of the raw data they accumulated. Thus at first they determined the probability that the scouts would surmount the opposition of fighters ($Q_{иа}$), then the probability of surmounting resistance by antiaircraft missile complexes ($Q_{зур}$) and then the "enemy's" antiaircraft resources in general ($Q_{ПВО}$). This probability was found to differ for the flight to the target, the time over target and the return route. The probability of detecting the objective was also determined in application to the direct visibility conditions ($W_в$) and the possibilities of the reconnaissance cameras ($W_а$). The navigators determined the probability of reaching the objective, corrected for different ranges and different altitudes.

Logical analysis of the calculated indicators, in their different combinations, made it possible to select the most favorable conditions for completing that reconnaissance mission. Thus in order to raise the probability of surmounting "enemy" air defenses the crews plotted their routes within the zones of lowest density of antiaircraft resources, and, considering the possibilities for avoiding dangerous antiaircraft groupings they selected the flight profile and speed and the maneuvers in such a way as to reduce the time within radar range, within the kill zones of surface-to-air missiles and within the effective range of fighters.

The accuracy of target approach required for dependable detection and identification was determined with a consideration for the maneuvers of which the scout

Simulation of a Reconnaisance Flight



Key:

1. Commander's decision (plan of flying assignment)
2. Enemy air defenses
3. Formation of raw data
4. Reconnaissance objective
5. Calculation of indicators and logical analysis
6. Selection and justification of variants
7. Evasion of antiaircraft resources by scout
8. Detection and accuracy of approach to objective
9. Effectiveness assessment on the basis of different criteria
10. Tactics of avoiding attack by enemy fighters and surface-to-air missiles
11. Optimum variant of reconnaissance flight
12. Flight route, profile, velocity, maneuvers on route and over objective
13. Objective search and observation tactics

was capable and the possibilities of the reconnaissance cameras. The crews then superimposed the templates bearing the maneuver trajectories and showing the area covered by the cameras over the objective to determine the permissible accuracy of approach to the objective and the area of photography. Using nomograms, graphs and tables, they analyzed other indicators as well.

During this part of the work, which we must admit is laborious, Major Terekhov made sure that his subordinates could reproduce all possible events and associations in their logical sequence, and that they had a clear idea of the results of their calculations. The hardest thing was to reveal in the model those elements which could not be determined uniquely. But inasmuch as the degree of uncertainty of any reconnaissance flight is rather high, the limits of changes in the situation were simulated within the entire range of possible conditions.

But certain specific questions did arise at this time: How many and what kind of tactical situations should be selected from the wealth of possible situations? To solve this puzzle some of the crews suggested taking one--the most difficult--and analyzing it in detail. But they found that it was impossible to find categorical answers to the posed questions, since this would contradict the nature of creative thinking. Several situations must be simulated in relation to each flying assignment, in dependence upon the evolving situation. Much depends on the degree of uncertainty of the anticipated situation. But this is not the entire answer. After all, it often happens that even in similar conditions crews must operate differently. Using cybernetic terminology, we can say that the same phenomenon may be reflected by different models, and all models would be adequate and even equivalent. But the situation requires a fully definite decision, one that is valid, original and unexpected by the enemy. This is a time when we cannot do without the volitional qualities, experience and intuition of the commander.

There is a certain general law governing the ratio of the volitional factor and calculations, expressed in a well known folk saying: Measure seven times before you cut. A clear preference is given to calculations (7:1), but only in the first phases of simulation, so that enough statistical material could be acquired to evaluate the effectiveness of different tactics and, in the final analysis, select the flight variant which would be optimum in relation to the anticipated situation on the ground and in the air.

And so, several tactical situations--and not all of the possible ones--were simulated under the guidance of the experienced commander. Before the variants of the reconnaissance flight were chosen and validated, the obtained results were processed, compared and analyzed and the effectiveness of each variant was assessed on the basis of specific criteria. As we can see from the diagram, these criteria were: for evaluating the effectiveness of surmounting "enemy" air defenses--evasion of antiaircraft resources by the scout, and for assessing the effectiveness of the objective's reconnaissance--its detection and the accuracy with which it is approached, in compliance with the photography conditions. The overall success of the mission was determined on the basis of these particular criteria.

The variants arrived at on the basis of the criterion of surmounting air defenses were chosen by simulating the actions of the sides (the scout and the antiaircraft system). The crew compared and selected those forms of maneuvers and those tactics which would insure the greatest effectiveness (covertness, surprise). The points at which maneuver was to begin on approaching the radar detection zones, the kill areas of the surface-to-air missiles and the interception zones of "enemy" fighters were determined, correspondingly, the crews determined the forms, parameters and segments of the antimissile and antifighter maneuvers. The variants based on the criterion of objective reconnaissance were chosen in the same way. The suitable maneuvers and tactics associated with searching for and observing the objective were considered and selected.

The optimum variant--the one insuring the greatest effectiveness of mission fulfillment in the given situation--gradually took shape. The fact that one of the models seemed preferable to others did not at all exclude the need for

thoroughly analyzing the other variants as well. This is understandable, since the enemy would probably make it necessary for the scouts to make changes in their actions, and in organizing his effort against the scouts, he would probably try to avoid stereotypy. This is why the experienced commander also foresaw the order of actions to be taken by the crews in response to significant deviations from the anticipated situation. Other variants optimum for these conditions were then developed as well. It is precisely in diversity that the source of creative inquiry lay, and that room was provided for utilization of the knowledge, experience and tactical thinking of the crews.

Major Terekhov attentively listened to the different points of view, and he did not rush to end disputes, since through such discussion the most deeply concealed mutual relationships between tactics and equipment reveal themselves, and well known formulas and graphs acquire new tactical meaning. Finally the search for the optimum variants came to an end. The pilots and navigators wrote down the results and the tactical recommendations in their work books.

Summarizing, let me qualify that the order of simulation is described here in simplified form. I intentionally limited the discussion only to the reconnaissance objective, ignoring the actions to be taken by the crews over the objective and the return route. Moreover the discussion centered on use of only the graph analysis method of simulation. Today flight crews have at their disposal fabulous integrated trainers that permit them to use seminatural simulation to work out combat maneuvers and tactics.

And so, we can conclude that different variants of reconnaissance flights, as well as different variants of other kinds of missions, are developed on the basis of strict qualitative and quantitative assessments and precise calculations. "But no one is arguing the contrary," the reader might say. "The decisions of commanders have always been based on precise quantitative grounds." Without a doubt, this is so. But no matter how complex the mathematical procedures we may use, we can never calculate everything today. We cannot forget that although the possibilities of simulation are enormous, they are not infinite. No mathematical tool and no computer can eliminate or even reveal mistakes in the logic of a pilot or commander attempting to assess a situation and predict actions, if he had not delved deeply into the nature of modern combat and the reconnaissance process. Such a shortcoming cannot be compensated by any mathematical tricks. The dialectics of decision making and development of the different variants of combat flights are such that the will, experience and intuition of the commander intertwine closely with strict and laborious calculations. Unfortunately we still encounter commanders who rely only on common sense when they make their decisions and develop different variants of a combat assignment, attempting to arrive at a quick solution without making any calculations. Experience has shown that this leads to stereotypic decisions and actions, and that sizeable losses may result in a combat situation.

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MISCALCULATIONS OF FLIGHT DATA DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) pp 30-31

[Article by Lt Col Med Serv V. Pekshev: "Orientation Was Temporarily Lost"]

[Text] Having completed its assignment, the crew made its way back to the airfield. Preparing for the landing, navigator Major M. Perevertun placed his work station in order. The craft commander, Senior Lieutenant A. Didechkin, also prepared for landing. The landing strip was now close by, and now it was time for the pilot to break through the clouds and begin his descent.

But suddenly all of the electric instruments stopped working. An emergency situation arose aboard.

How did this happen?

From the very beginning the crew assumed that unintentional shut-down of the airplane's electric system may have been the cause of the failure. Without delay Senior Lieutenant Didechkin ordered Officer Perevertun to check their plane's power supply, turning special attention to the positions of the generator tumbler switches: He thought that the navigator may have accidentally moved them to the "off" position. The pilot, meanwhile, noticing a break in the clouds on their course, guided his airplane in that direction.

An analysis of this near-accident showed that that navigator had completely lost control in a relatively simple situation. Several times he switched on and immediately switched off the generators, mistaking the on position of the switches for their off position. And all the while, the officer stubbornly reported to the commander that the generators were on. It was only after persistent and decisive demands from Senior Lieutenant Didechkin that Major Perevertun stopped his senseless actions with the tumbler switches, finally leaving them in their "on" position. The emergency situation was corrected, and the crew landed at its airfield safely.

And so, the near-accident arose due to a mistake made by the navigator. But what was the root cause? Why did a top-class specialist with considerable flying hours and much experience in flying and instruction aboard airplanes and helicopters work with such inexcusable rashness? Psychological analysis

of the activities of the navigator in this flight would assist in answering the question. This is what specialists analyzing the near-accident did. And here is what they concluded.

Having successfully completed the flying assignment, relying upon his knowledge and experience, and unconsciously treating the return to the airfield as just a secondary matter, Major Perevertun allowed himself to psychologically weaken, and naturally he reduced his control over his own work with the apparatus as he placed his cockpit in order prior to landing. It was at this time that he mechanically turned off the generators, shutting down the airplane's power supply. The pilot's command to check the airplane's power supply system and the position of the generator tumbler switches caught him unawares. Thus premature psychological demobilization created a situation where Officer Perevertun was unable to orient himself and independently correct the problem on suddenly being faced by extreme conditions. Energetic interference by the crew commander was required to pull the navigator out of his extreme confusion.

There are many examples in flying practice where an excellently trained crew that had successfully completed a highly complex assignment made inexcusable mistakes and suffered near-accidents in the performance of simple elements of flight--returning to one's airfield, taxiing off of the runway, taxiing to the parking pad and so on--all as a result of premature relaxation.

Everything that happened with Major Perevertun might not have occurred, had he not permitted himself to weaken psychologically after completing the main part of his flying assignment, and had he worked more conscientiously and expertly with the equipment in the air. As the analysis revealed, the navigator had prepared for his flying assignment only in formal terms, in haste. He did not undergo any training in the aircraft cockpit. No one checked up on the officer's proficiency.

We should add to this that in view of his work position, Major Perevertun concurrently flew on occasion as a navigator aboard helicopters. Thus, not having undergone training, and not having refreshed his "airplane stereotype" of actions in the cockpit, he was unable to psychologically orient himself in the occurring events. Thus inadequate and low quality of preliminary and psychological preparations for the particular flight was the main cause of first the mistake and then the near-accident experienced at the fault of Senior Lieutenant Didechkin's crew.

A no less serious near-accident was experienced by the crew of a transport airplane commanded by Captain V. Ivanov during a cargo run.

A 1,000-kilometer flight was behind them. As usual, after finishing the next of a series of turns the craft navigator set the remaining distance to the last turn on the counters, reported it to the craft commander and went about his business. Then came the final turn. But unfortunately this was not the last turn for the crew, because after the calculated time passed, their airfield was nowhere in sight. Wandering about for some time in what they thought was the waiting zone, the crew never was able to recover its orientation and find the airfield. The crew, which was also carrying an instructor pilot and an instructor navigator, landed at an alternate airfield with a sense of embarrassment and anger.

The reason why such highly qualified pilots and navigators temporarily lost orientation was then analyzed. As in the example examined above, comrades that analyzed the flight came to the conclusion that the root evil lay in the insufficient psychological self-control of the airmen. The events occurred in the following sequence.

Having set the remaining distance on the counters, the craft navigator made a 100 kilometer error. The crew members and the instructors did not verify the correctness of the coordinates. They did not monitor the flying time. (After all, they had come a very long way, everything seemed to be going all right, and there were just a few hundred kilometers to the airfield.) In other words the crew performed the last phases of its assignment in a state of anticipation of the end of a long flight, in a state of psychological demobilization.

No one noticed that the remaining distance was determined 100 kilometers short. This is why the airmen began searching for the airfield long before reaching it, and why they never did find it.

All of this caused confusion in the crew members and instructors. For more than half an hour the airplane circled above what was believed to be the location of the airfield. Coming to realize the fruitlessness of their attempts, Captain Ivanov assumed a course to the alternate airfield, never having made full use of the entire complex of aircraft piloting resources aboard. We can see in this case as well that psychological demobilization prior to the end of a long flight played an evil joke upon the crew. Having gone more than a thousand kilometers on an unfamiliar route in an excellent manner, as a result of premature relaxation they could not handle the last 100 kilometers of the route. And this was all because little time was allocated for the preliminary preparations for this flight, and the psychological preparedness of the flight personnel was clearly inadequate.

These facts persuasively show that wherever preliminary preparations are made only in formal terms, and wherever adequate attention is not devoted to the moral and psychological preparedness of airmen for a concrete assignment, near-accidents cannot be avoided. The pilot, the navigator, and other crew members must always assimilate the theoretical question completely, undergo good training, mentally work out the forthcoming flight several times and prepare themselves for the anticipated situation. Only this can guarantee success of any assignment, including long flights.

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MISPERCEPTION OF ALTITUDE DISCUSSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) pp 26-27

[Article by Maj N. Litvinchuk, military pilot 1st class, and Capt Med Serv V. Kozlov: "By Visual Estimation, But Accurately"]

[Text] The tactical flying exercise was underway. The pair led by Major M. Nenashev approached the area of the practice range. The pilots quickly detected the target, which they were to annihilate with a bomb run. The leader assumed the necessary combat formation. As the airplane began its dive, Nenashev turned his eyes in the direction ofcliffs forward on their course, and he saw that were they to make the bomb run at the prescribed altitude and were they not to recover energetically from the dive, the follower could collide with the obstacle. Thus he decided to make the bomb run at a higher altitude. The results of the bomb run were mediocre. After the airplane recovered from its dive, the pilot realized that he had underestimated the distance to the cliff: It was much greater.

There are also many other examples from flying practice where an experienced airman who had good theoretical training made significant deviations from his place in formation, estimated altitude inaccurately and made mistakes during landing. Without a doubt deviations occurring in different phases of flight have different causes. But research and analysis of such mistakes have shown that many of them are associated with inadequate training in visual estimation.

Visual estimation is the ability of an individual to determine dimensions in space, to include distance, visually, without using measuring instruments. Its role in flying is difficult to overstate. It would be sufficient to point out that a pilot uses visual perception to orient himself in space, to pilot the airpane and to perform combat maneuvers. A trained airman can accurately estimate many flight parameters visually.

A pilot determines distance during flight on the basis of the angular dimensions of visible objects, arisal of objects or their details or their disappearance from the field of vision, the rate at which landmarks move and other clues. Visual estimation is developed on the basis of the pilot's experience, and it is improved in the course of flying. The ability is the result of formation of complex dependencies and relationships between different objects and their

characteristics. Under certain flying conditions the error of visually estimating distance may assume large proportions. Let us examine some of the reasons for this.

When a pilot flies over unfamiliar terrain for the first time, as a rule the visually determined altitude is up to 30 percent off of the real altitude. The reason for this is absence of visually familiar objects with angular dimensions that could be used to accurately estimate the distance to the ground. This situation is also observed when a pilot flies in featureless terrain (over deserts, water, snowfields) and after long interruptions in flying. Practice has shown that in addition to loss of professional habits, the pilot's capability for visual estimation weakens after a break in flying: Mistakes in estimating ranges grow, and the time required to determine the parameters of the combat formation and the altitude increases. This raises nervous and emotional tension and reduces the quality of activity. This is why, when analyzing the causes of mistakes, not only would it be desirable to examine them from just the narrow professional point of view, but it would also be important to consider general psychological preparedness, to include training in visual estimation.

A pilot acquires the habit of altitude determination while flying with an instructor and on his own. He assumes the needed altitude in relation to reference points outside the cockpit, and he monitors it by his instruments. At such a time, a dependence between the readings of the altimeters and the angular dimensions and rate of movement of landmarks forms. When these dependencies become sufficiently sure, the airman is able to evaluate altitude on the basis of the angular dimensions of previously known objects, rarely resorting to the instrument readings. In these cases mistakes do not exceed 10 percent. Experience has shown that good results are achieved by as early as the third flight, after completing 12-15 particular tasks in each of them.

Special requirements are imposed on the accuracy with which a pilot determines the distance to the ground during landing. The way altitude is visually estimated in this case has its unique features. As we know, altitude, flying speed and the appearance of the ground surface change considerably as the airplane descends on its glide path. Moreover the time passes swiftly from the moment the airplane passes over the long-range homing beacon and until it lands. This period of time is characterized by high precision of actions, distributed attention and fast switching of attention. Whether or not the airplane is leveled off above the ground and landed smoothly depends directly on the accuracy with which the pilot determines the distance to the ground and on how well the actions with the controls are coordinated with this estimate. When the pilot switches his gaze from the accustomed direction, the angular velocity with which objects on the ground move changes, resulting in mistakes such as leveling off too high or too low, landing at too high or too low a speed and inconsistent landing quality. In this case it is said that the pilot has "lost" the ground. Thus it is no accident that commanders demand that the seat be adjusted to a strictly determined height prior to every take-off, and that they always fix their eyes at the same angle when landing. Pilots use various techniques and clues to monitor change in altitude as they level off. It all depends on acquired knowledge and flying experience. It should be noted that experienced pilots are able to distinguish altitude deviations of about 10 centimeters.

Visual estimation is important to determining the distances to various targets on the ground and in the air. From a psychological standpoint what the pilot does in this case is compare the angular dimensions of a real object with previously formed and memorized standards of angular dimensions of such an object located a particular distance away. This means that if the standard had not been formed sufficiently well, mistakes in estimating distance to the object would increase. Research has shown that when training in visual estimation is poor, the error in determining a distance equal to 1.5 kilometers is 17 percent, while after training the error is about 5 percent.

A pilot can be trained to visually estimate distances to ground targets both in the air and on the ground. When flying at low and minimum altitude, after detecting and identifying a ground objective the pilot determines the range to it, and he monitors it on the basis of time and speed.

On the ground, photographic target models are used to shape the habits of visual estimation of distances. The angular dimensions of these models correspond to real dimensions at known ranges. As the pilot familiarizes himself with the photograph, he is told the real distance to the object. After looking at other photographs of known targets, he takes a test in which he determines range and angular dimensions. The instructor scores the correctness of the responses and the nature and size of the errors. Practice has shown that training with 12-16 photographic models provides the needed results.

The position of the sun influences the accuracy with which range to a target is determined. Errors are smaller when the sun is at a 100-180° angle.

Good visual estimation has great significance to pilots flying in a group as followers. Control of the required distance to an airplane in front is the hardest thing to do. In this case the task of the follower is to accurately estimate its current value and promptly detect changes. These parameters are determined on the basis of the angular dimensions of the airplane and its parts, and their change. The minimum change in distance between airplanes which a follower is capable of noticing is an average of 10 percent of the initial value. But pilots often make mistakes attaining 30-40 percent. It was established in test flights that the accuracy with which prescribed formation parameters are maintained is influenced, first, by the amount of training in visual estimation; secondly by how well the pilot is trained to fly in a group; third by the complexity of the task and the preparedness of the pilot for its completion--for example attacking a target in combat formation using real ammunition. Absence of sound habits sometimes compels a follower to consciously increase the interval or distance in the interests of safety. As a rule he increases the prescribed range. All of this says that when a follower fails to maintain the prescribed parameters of a combat formation, we must first establish the cause, and eliminate it. If visual estimation is inadequate, additional lessons should be provided.

Three basic methods are used to train visual estimation on the ground.

In the first, recommended by the flight training manuals, airplanes are parked on the ground at prescribed intervals and distances, and a follower sitting in the cockpit of his airplane memorizes the angular dimensions of the leader and his projection on the glazing of the canopy.

In the second method the pilot measures different distances to the airplane from specific angles of view, and he memorizes the angular dimensions of the airplane and the visibility of individual details and parts. This method can be used by all, and it does not require special training. It should be remembered, however, that a pilot attempting to determine distance must fix his gaze upon the airplane, and not allow it to shift along the ground such that other reference points would be used.

In the third method specially made drawings or photographic models bearing an image of an airplane at a particular scale are employed. During training, these representations are set up at particular distances such that the angular dimensions of the silhouette of the airplane and its individual parts and details would correspond to real dimensions at the given range.

It should be pointed out that training in visual estimation is very important when pilots must fly over mountains after having flown over level terrain. The absolutely new pattern of the earth's surface and presence of mountains of different heights and shapes located at distances unknown to the pilot raise his nervous and emotional tension and draw the pilot's attention. This has an unfavorable influence on control of other flight parameters, which then may be exceeded impermissibly.

When a pilot is faced with new conditions, proper organization of his introduction to them and mandatory training in visual estimation under the new conditions would preclude deviations and raise flight safety.

11004
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FUEL ECONOMY STRESSED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) pp 6-7

[Article by Maj Gen Avn K. Krepskiy, deputy commander for rear services, Red Banner Belorussian Military District Air Forces: "A Barrier Against Losses"]

[Text] The Communist Party attaches enormous significance to economy and thrift, and to a careful attitude toward national wealth. It is no accident that the CPSU Central Committee and USSR Council of Ministers decree "On Strengthening Work to Economize on and Make Sensible Use of Raw Materials, Fuel, Power and Other Resources" states that every Soviet citizen must actively include himself in the struggle for economy and thrift at work and in the home, and make his concrete contribution to this nationwide effort. The decree emphasizes Lenin's idea that communism begins with the daily concern of the laborers for preserving every pound of bread, coal and iron. This idea is also a leitmotif of decisions of the May (1982) CPSU Central Committee Plenum.

Our military airmen correctly understand what they must do to promote economy and thrift.

Considerable experience in preserving national wealth was accumulated in the course of exercise "Zapad-81." A folk saying declares: Save a drop and you'll save a ton. And this is in fact so, since it is confirmed by life itself. Take as an example the separate airfield technical maintenance battalion commanded by Lieutenant Colonel D. Sarakhan. Just prior to the exercise the staff officers got together with specialists to draw up recommendations, which were then submitted to the subunit commanders and service chiefs. At the airfield to which they were to fly, the officers prepared logs to account for the amount of petroleum products expended in the subunits, they prepared containers to collect fuel remnants at the helicopter parking pads, in the technical maintenance unit and in the parking places of the ground flight support resources, they reviewed the engine testing schedule, they organized the use of motor transport allocated to squadron deputy commanders for air force engineer service, and they placed the work of all flight support resources under strict control. All of this produced good fruits--several tons of fuel were economized. The airmen satisfied the pledges they had adopted prior to the exercise.

Wherever specialists of the air force engineer service supporting the subunits work--at the airfields, the special vehicle motor pools, the airplane parking

pads, the fuel and lubricant depots, the fueling pumps or repair areas--they always maintain a careful attitude toward state assets and preserve the national wealth. Great credit for this belongs to the commanders, political workers and the sizeable detachment of party and Komsomol activists who encourage their fellow servicemen with word and with deed to perform their military duty conscientiously.

Army life imposes high requirements upon party activists. They are called upon to serve as dependable assistants to commanders and political workers, and they must serve as an example of conscious discipline and of a creative, interested attitude toward their responsibilities. Numerous examples to support this thought can be found in the life of the troop subunits.

The transfer pumps droned evenly at the fueling station. One could hear the short commands of the specialists. The work day at the fuel and lubricant depot was in full swing. There would be flying today. The tank trucks drove up to the storage tanks, filled their tanks and returned to the parking pads where they were awaited by the airplane technicians and mechanics.

Private N. Bondarev cautiously drove his vehicle up to the fueling station. He had pledged to do all of his flight support jobs with a grade of "excellent." At a recent Komsomol meeting the drivers promised to economize on fuel, rubber and engine life. And this was the first flying day after the meeting. Nikolay opened the filling spout of his tank, inserted the hose and turned on the pump. He carefully watched the fuel level. Finally, quickly turning the pump off, he shut and sealed the filling spout firmly.

The refueling was completed in short time and, what is important, economically. This is just one visual example of a thrifty attitude toward fuel in the subunit in which Major K. Salat is the commander and Captain V. Savelev is the secretary of the party organization.

There are many such military collectives in our district's aviation. The command and the party and Komsomol organizations of the separate airfield technical maintenance battalion commanded by Major O. Agayev keep economization of fuel, lubricants and other materials at the center of their attention. As always, communists and Komsomol members set the example. Take for example activists N. Radeyev and V. Sergeyev. These special vehicle drivers economized hundreds of kilograms of valuable fuel in their flight support efforts. The successes of the best specialists are published in battle leaflets, wall newspapers, pictorial bulletins and competition progress reports. Those who distinguish themselves are rewarded by the commander.

Personnel of the district's air units are intolerant of those who are undisciplined and who work carelessly.

Unfortunately cases of the following sort occur as well. Once Senior Lieutenant of Technical Service V. Kostyukov tried to fuel his personal vehicle at the airfield. He was punished for this. The command and the party and Komosomol organizations recalled to those who are careless with state valuables that such a stance does irreversible harm to the overall struggle for high combat readiness of the air units and subunits and for firm military discipline and order.

People's controllers are making an invaluable contribution to this state effort. "Not one violation, not one case of misappropriation, waste and lack of discipline," stated the Accountability Report of the CPSU Central Committee to the 26th CPSU Congress, "must escape the watchful eyes of the people's controllers." They are taking an active part in organizing the competition in the air units for the "Subunit of the Thrifty" title and for satisfaction of pledges to economize on petroleum, oils and lubricants, electric power, engine life and other resources. The subunits that come out ahead on the basis of the results of each month are awarded perpetual pennants.

The experience of the people's control group headed by Major V. Petrov is instructive in my opinion. The controller consults in detail with specialists, and they study the guidelines on operating, repairing and storing the technical resources of the fuel supply service and so on. They discuss their inspection results at conferences of the executive staff. Then as a rule the political section recommends that the party and Komsomol organizations discuss the problems associated with raising the responsibility of communists and Komsomol members for preserving materials and technical resources. The command implements immediate measures of administrative and party influence upon officials who are indifferent to economization and thrift. I think that this approach to the problem is in keeping with the requirements of the 26th CPSU Congress and the CPSU Central Committee decree "On Measures for Further Improvement of the Work of People's Control Organs and Intensification of Party Leadership of Them in Connection With Adoption of the USSR Law on People's Control."

The struggle for economy and thrift is not a short-term campaign but a planned, well-organized process in which the moral aspects of indoctrination of military airmen are considered. Protecting the people's wealth means maintaining a communist attitude toward labor. Every specialist, no matter what his responsibilities, must be thrifty and careful in handling equipment, fuels and lubricants. If a driver takes a longer route to the airfield, if a pilot lands his airplane roughly and blows out a tire, if a navigator makes a mistake in his calculations and if a crew is late in reaching its place, all of this does harm to the common effort.

The preparedness of an airfield for flying depends entirely upon the quality of the work done by specialists of the airfield maintenance subunits. Even the slightest deviation from the rules of equipment maintenance would invariably lead to mechanical damage of the paved surfaces, particles of which may be sucked up by an airpane engine, which can mean a flying accident. Unfortunately we still encounter such facts. Thus because of careless cleaning of the landing strip by drivers in the airfield service company commanded by Captain A. Bykov, an engine that had not yet served its useful life had to be taken off of an airplane.

Squadron engineers and technicians also bear great responsibility for the condition of airplane parking pads. Experience has shown that wherever specialists always check the cleanliness of the concrete, the quality of flying is higher. As an example in the squadron in which Major of Technical Service I. Kireyev is the deputy commander for the air engineer service, the personnel mandatorily inspect the concrete pad before engine testing begins. It is no accident that this subunit is constantly in first place in the "Best Parking Pad" competition.

Most officers, warrant officers, NCOs and privates of the district's air force rear subunits set a good example in service, combat training and economical expenditure of state resources. Communists and Komsomol members help commanders, political workers and people's controllers to indoctrinate the airmen in a spirit of discipline and exactingness toward themselves and others and to seek the most progressive, effective ways of working with the equipment. They also make an effort to introduce efficiency proposals. "A Barrier Against Losses!"--this must be the motto of every airman. This is what the party and Komsomol activists are working for in their efforts to fulfill the decisions of the 26th CPSU Congress. This is what is required of us by the military oath as well: "...concientiously study military affairs, preserve military and national property in every possible way...."

11004
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'SALYUT-7' DESCRIBED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 82 (signed to press 2 Aug 82) pp 44-45

[Article by A. Aleksandrov: "'Salyut-7'"]

> [Text] The "Salyut-7" orbiting space station was launched on 19 April 1982. Readers have asked: What is it like, and how does it differ from "Salyut-6"?

The "Salyut-7" orbiting space station differs little from its relative, but it is not an exact copy of it. Modernization of the "Salyut-6" station has made it possible to raise the operating effectiveness of the apparatus, significantly expand the program of scientific-technical research and create more-comfortable conditions for the work and rest of the crew.

The station consists of three sealed compartments (a working compartment and two transfer compartments communicating with the docking units) and two unsealed compartments (the machine and scientific apparatus compartments). Its length is about 15 meters, the greatest diameter of the sealed compartment is a little more than 4 meters, and the transverse spread of the solar panels is 17 meters. When two spacecraft are docked, the length of the space complex increases to 30 meters.

Outwardly the three solar panels do not differ from those which supplied electric power to "Salyut-6." However the output of this power generator is about 10 percent greater owing to greater unit output capacity of the panel's photocells.

There is one more innovation: Some of the portholes are covered on the outside by transparent lids, which would make it possible to keep the portholes clean despite the fact that the station will find itself in meteor showers on occasion. The lids can be opened for experiments.

The scientific apparatus compartment experienced the greatest changes. The BST-1M submillimeter telescope has been replaced by an X-ray apparatus complex.

Inside "Salyut-7," the horizontal layout has been maintained, such that the "floor" and "ceiling" are parallel to the station's longitudinal axis. The

posts for controlling the service systems and scientific apparatus, a mini-stadium (including a bicycle ergometer and a treadmill), two airlock chambers and sleeping places are located efficiently. The new space house is more comfortable. There is more light, even though the number of light fixtures was not increased: They are simply located in a different pattern. The spectral composition of the light has also been changed to improve light transmission when taking color photographs and movies. The airplane-type chair has disappeared from the main control post. It was found that in the weightless conditions it would be enough to have a small moveable chair and leg supports.

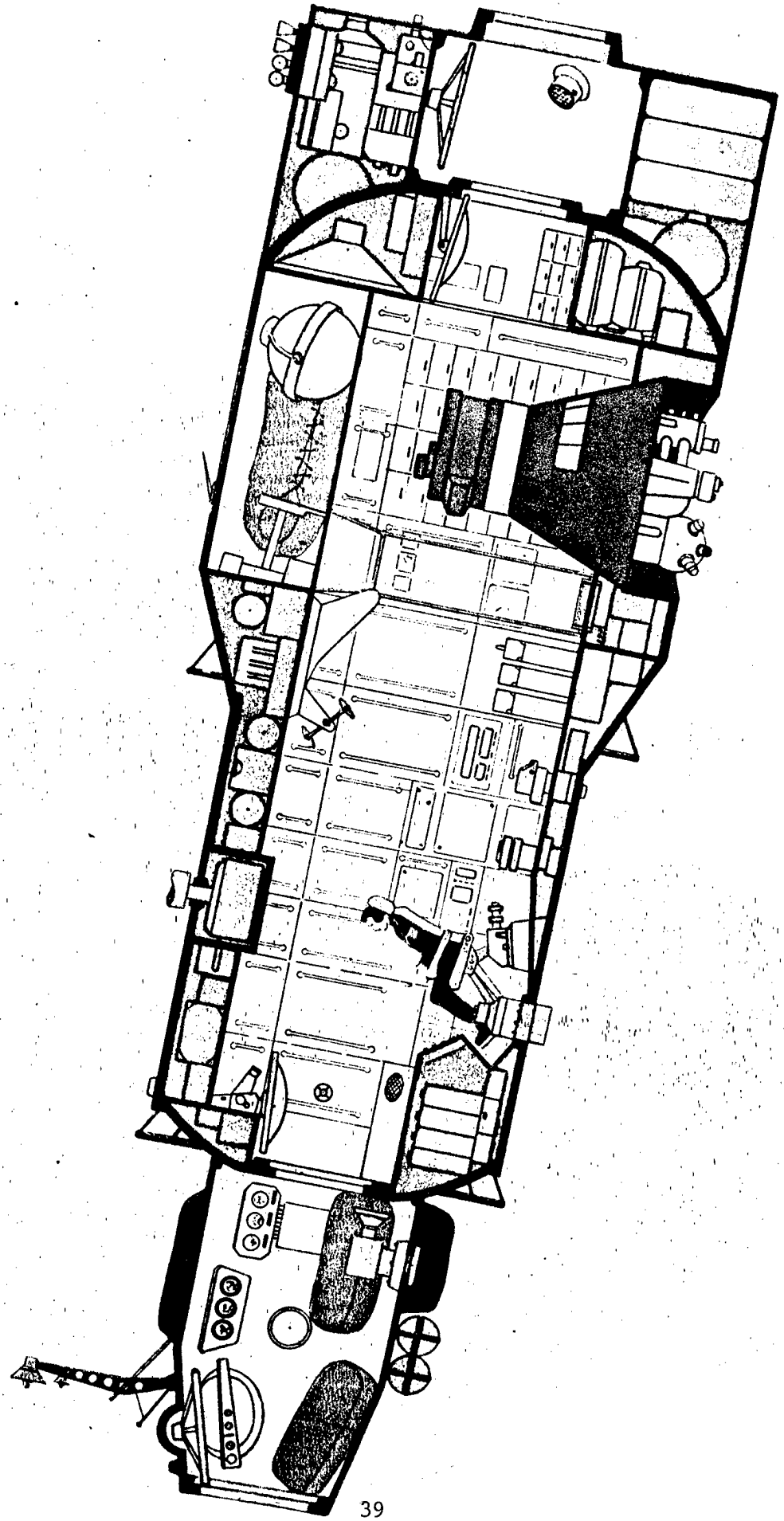
A few other design changes have created additional comforts for the crew. Holders for tools and for writing instruments used by the cosmonauts have been added. New objects have also appeared, particularly ones with plug-in electric sockets. Access to a number of blocks has been made easier, which will reduce the time and raise the quality of repair jobs. Some of the cumbersome blocks of the life support systems have broken down into several units. This facilitates the loading and unloading operations.

Portable miniature radio sets make it possible for cosmonauts in different compartments of the complex to maintain communication with each other without having to turn on the intercom, which they can do only at the control posts. The crew can exchange information with the earth by way of a retransmitter installed in the work compartment.

The "Del'ta" navigation system aboard "Salyut-6" was one of the experimental systems. Now it is an integral part of the station. Its functions are extremely broad: performing navigational calculations, turning radio apparatus on and off during communication sessions, providing reference information. Computers play an especially significant role in scientific research requiring the aiming of apparatus at particular objects in space. A program for the work of the station over a long period of time (several orbits for example) is fed into the computer. Then at a previously calculated time the computer transmits commands to the orientation system to turn the station and aim the scientific apparatus at particular objects in space, after which it turns on the apparatus itself. This is the way the X-ray complex is used in research.

One of the airlock chambers used to remove waste containers from the station was modernized aboard "Salyut-6." As a result a possibility arose for including a "Splav-01" industrial furnace and other scientific research apparatus in the airlock. Now the second chamber has also been improved, making it possible to significantly expand the range of experiments making use of the vacuum of outer space.

Another object that has been modernized is the heat control system. In distinction from some others, this one operates continuously. Although the outer and inner hydraulic systems have been made redundant, the operating time of the hydraulic blocks making them up is still limited. Aboard "Salyut-7," panels containing faulty hydraulic blocks may be replaced, and the system can be topped off with liquid and gaseous components while in flight.



The long duration of flying has made it necessary to appraoch the diet of the cosmonauts in a new way. From now on, the crew can select its meals to its own taste, though within the limits of a recommended menu. A so-called "cafeteria-style" system of delivering and storing foodstuffs now affords such a possibility: At the request of the cosmonauts, their favorite dishes are delivered aboard--borsch and bouillon, liverwurst, juices, condiments and the like. Thus the time of pre-packaged meals has come to an end.

A real water pipeline providing cold water has also appeared aboard "Salyut-7." The "Rodnik" (this is the name of the new system) consists of a reservoir--two tanks with a total volume of more than 400 liters, located in the station's machine room, the pipeline itself, which delivers water to the "kitchen," and finally a tap. Everything is completely like on earth. The reservoir is refilled out of similar tanks aboard a "Progress" cargo craft.

As before, hot water is provided by a system that regenerates atmospheric moisture. It proved itself well before, having supplied the crew of "Salyut-6" with more than 600 liters of hot water. An electric furnace has been added to the former shower stall. Now, before washing, cosmonauts can first take a good steam bath.

The "Salyut-7" is a multiple-profile orbiting laboratory intended for astrophysical, geophysical, biomedical and other studies and experiments in the conditions of space flight.

Astrophysical studies are supported by a huge complex of scientific apparatus aboard the station. It weighs about 500 kg. The instruments are located in open space and in the scientific apparatus compartment. They are intended for analysis of the spectral composition and temporal variations of currents of roentgen radiation and for study of space objects which are thoughtto emit such radiation. Their prototypes operated successfully aboard "Salyut-4." But now the instruments are qualitatively new.

The useful area of the detectors, as an example, has been increased by a factor of 10, as a result of which sensitivity to emissions has almost tripled. And when we consider the use of a number of devices that reduce the influence of the background of charged particles, we can anticipate that the real sensitivity will increase by five to six times.

The main instruments of the geophysical research complex are already familiar to the readers--the MKF-6M and KATE-140 photographic cameras, spectrometric apparatus and portable photographic and optical apparatus.

Medical research conducted aboard "Salyut-7" focuses on studying the conditions experienced by the cosmonauts inside the station. The composition of the atmosphere, its dust content and the level of noise created by the apparatus are analyzed. Investigation of the psychological climate of the crew has an important place. The reason for this is that the cosmonauts go on lengthy expeditions lasting many months, such that the station serves simultaneously as a home and an institute, a stadium and a movie theater, and in general it must fully support their living environment.

The biological equipment (about 10 units) is intended for studying various biological objects in the conditions of space. They are delivered to the station and returned to earth by "Soyuz-T" manned transport spacecraft.

In all, the "Salyut-7" has several dozen large and small instruments, but this does not limit the composition of the apparatus used in the extensive program of scientific-technical research. In the future, "Progress" cargo craft will deliver instruments to the station following the procedures used in the program of Soviet-French cooperation. The space expedition is continuing.

11004
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